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10/750,006	12/30/2003	Mika Ebihara	S004-5182	9318

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ADAMS & WILKS
31st Floor
50 Broadway
New York, NY 10004

EXAMINER

KANG, DONGHEE

ART UNIT PAPER NUMBER

2811

DATE MAILED: 08/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

58

Office Action Summary	Application No. 10/750,006	Applicant(s) EBIHARA, MIKA	
	Examiner Donghee Kang	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 8-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 & 8-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claim 1 & 9 are objected to because of the following informalities:

Re claim 1, the phrase "a low concentration source/drain region disposed in a region **over** the semiconductor substrate" is misdescriptive. The low concentration source/drain region is formed **in** a surface of the semiconductor substrate. Appropriate correction is required.

Re claim 9, the phrase "low concentration diffusion layer disposed on the surface of the semiconductor substrate" is misdescriptive. The low diffusion layers are formed **in** the surface of the semiconductor substrate. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claim 9 is rejected under 35 U.S.C. 102(a) as being anticipated by Kunikiyo (US 6,545,318).

Re claim 9, Kunikiyo teaches a semiconductor device comprising (Fig.1):

A semiconductor substrate (1) having a first conductivity type (P-type); a gate insulating film (5) disposed on a surface of the semiconductor substrate; a gate electrode (6) disposed on the gate insulating film; a plurality of low concentration diffusion layers (71 & 81) on the surface of the semiconductor substrate on opposite

sides of the gate electrode, the low concentration diffusion layers having a second conductivity type (N-type) different from the first conductivity type; an interlayer film (14) disposed over the semiconductor substrate for electrically isolating the gate electrode and the low concentration diffusion layers from wiring disposed on the interlayer film; a plurality of high concentration diffusion layers (7 & 8) having the second conductivity type and disposed only in portions of the respective low concentration diffusion layers directly under the respective contact holes. See also Col.4, lines 25 – 65.

4. Claims 9 & 14-16 are rejected under 35 U.S.C. 102(a) as being anticipated by Shiiki et al. (US 6,534,827).

Re claims 9 & 16, Shiiki et al. teach a semiconductor device comprising (Fig.5):
a semiconductor substrate (1) having a first conductivity type (n-type, 202); a gate insulating film (211, Fig.4D) disposed on a surface of the semiconductor substrate; a gate electrode (205) disposed on the gate insulating film; a plurality of low concentration diffusion layers (204) on the surface of the semiconductor substrate on opposite sides of the gate electrode, the low concentration diffusion layers having a second conductivity type (p-type) different from the first conductivity type; a BPSG interlayer film (213) disposed over the semiconductor substrate for electrically isolating the gate electrode and the low concentration diffusion layers from wiring disposed on the interlayer film; a plurality of high concentration diffusion layers (203) having the second conductivity type and disposed only in portions of the respective low

concentration diffusion layers directly under the respective contact holes. See also Col.6, line 24 – Col.8, line33.

Re claim 14, Shiiki et al. teach each of the low concentration diffusion layers has an impurity concentration of 1×10^{16} to 1×10^{18} atoms/cm³ (Col.7, lines 27-30).

Re claim 15, Shiiki et al. teach each of the high concentration diffusion layers has an impurity concentration of 1×10^{19} to 1×10^{20} atoms/cm³ (Col.7, lines 49-52).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-4 & 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunikiyo (US 6,545,318) in view of Havemann (US 6,753,563).

Re claims 1, 10 & 12, Kunikiyo teaches a semiconductor device comprising (Fig.1):

A semiconductor substrate (1) having a P-Type conductivity type; a field oxide film (4) disposed on the semiconductor substrate; a gate electrode (6) surrounded by the field oxide film and disposed on the semiconductor substrate through a gate oxide film (5); a low concentration source/drain region (71 & 81) disposed on the surface of the substrate surrounded by the field oxide film and the gate electrode, the low concentration source/drain region having an N-type; an interlayer film (14) disposed over the semiconductor substrate for electrically isolating the gate electrode and the low

Art Unit: 2811

concentration source/drain region from wirings disposed on the interlayer film; a plurality of etched contact holes extending through the interlayer film for electrically connecting the gate electrode and the low concentration source/drain region (Fig.2) with the wirings disposed on the interlayer film; and a plurality of high concentration diffusion layers (7 & 8) having the N-type and disposed only in respective portions of the low concentration source/drain region directly under the respective contact holes.

Kumikiyo does not teach a nitride film disposed under the interlayer film for preventing the semiconductor substrate from being overetched during formation of the etched contact holes in the interlayer film. Havemann teaches in Fig.1 forming nitride layer (32) to eliminate damage of semiconductor substrate during the formation of contact hole 30 (Col.4, line 65-Col.5, line 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the nitride layer of Havemann into the Kumikiyo's device since the nitride layer reduces or eliminates damage of semiconductor substrate during the formation of contact hole in the interlayer film.

Re claims 2-3 & 14-15, Kunikiyo teaches the low concentration and high concentration source/drain region have the impurity concentration which is in the claimed ranges (Col.4, lines 58-64).

Re claims 4, 11 & 13, Kumikiyo as modified by Havemann does not teach the nitride film has a film thickness of 100 to 500 Å.

It is an obvious matter of routine experimentation to find the optimal thickness ranges. Generally, difference in thickness will not support the patentability of subject

matter encompassed by the prior art unless there is evidence indicating such thickness is critical. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the thickness of the dielectric layer, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kunikiyo in view of Havemann as applied to claim 1 above, and further in view of Shiiki et al. (6,534,827).

Neither Kunikiyo nor Havemann teach the interlayer film comprising a BPSG interlayer film. Shiiki et al teach in Fig.5 the interlayer film 213 comprising a BPSG (Col.7, lines 37-38). Therefore, it would have been obvious in the art at the time the invention was made to use BPSG film as an interlayer film as taught by Shiiki in Kunikiyo's structure since it is a known material well suited for the intended purpose.

Response to Arguments

8. Applicant's arguments with respect to claims 1-4 & 8-16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steve Loke can be reached on 571-272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2811

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Donghee Kang, Ph.D.
Primary Examiner
Art Unit 2811

dhk